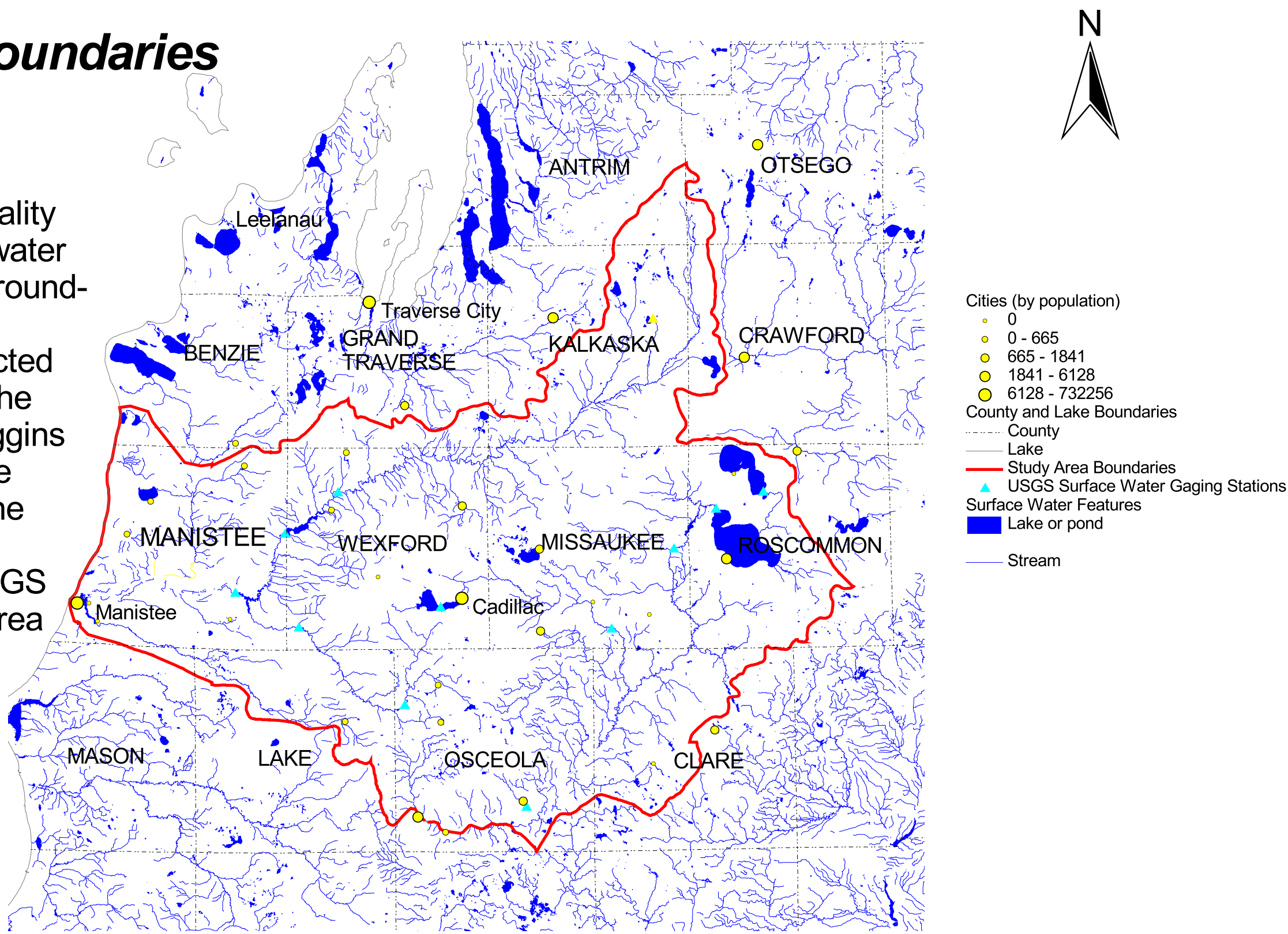


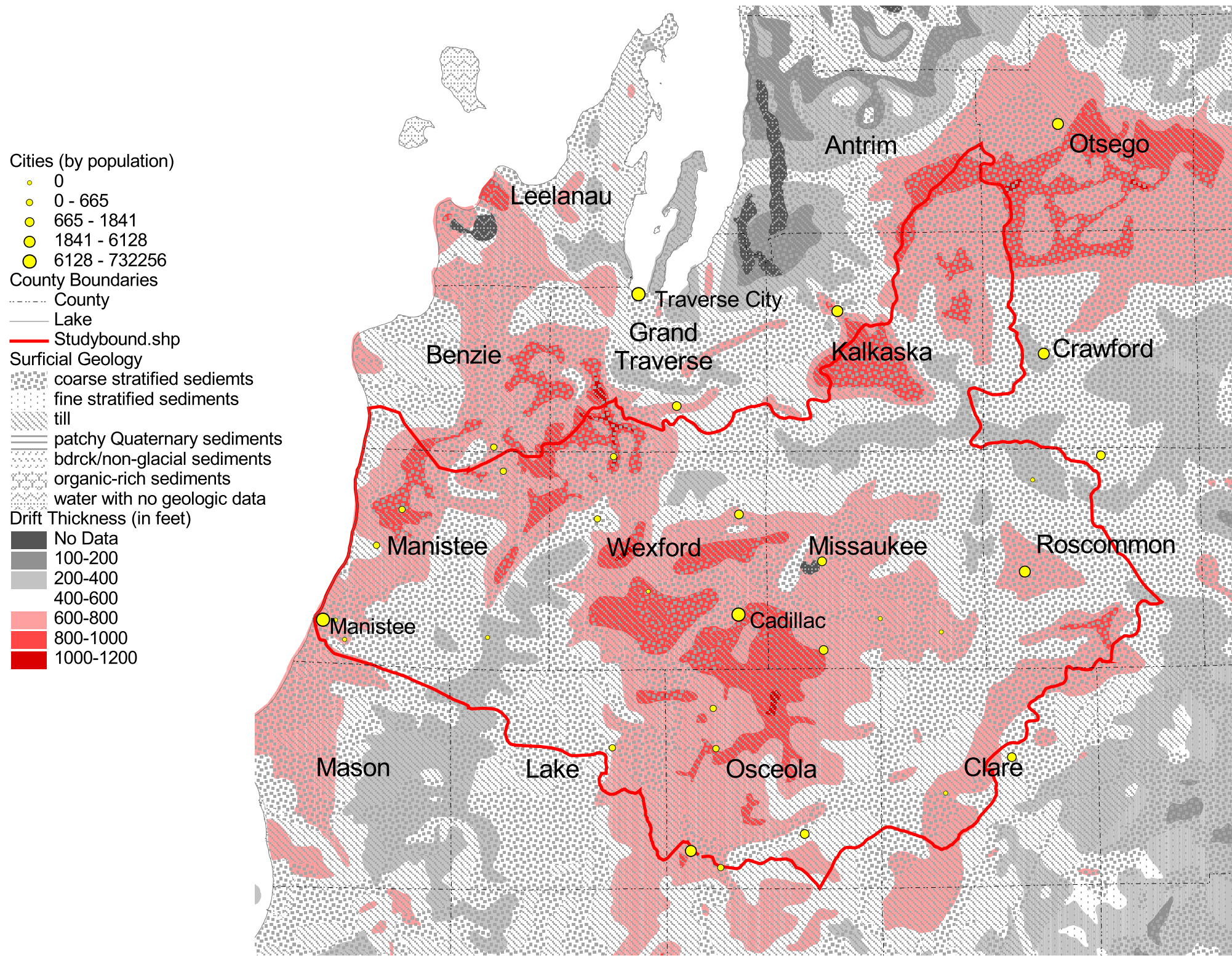
Preliminary Maps for a Hydrogeology and Ground-Water Resource Assessment of the Northwest Lower Peninsula, Michigan

Hydrologic Features and Study Area Boundaries

The U.S. Geological Survey in cooperation with the City of Cadillac and the Michigan Department of Environmental Quality has begun a project to model surficial geology and ground-water flow in Cadillac and the surrounding area. The study-area/ground-water flow model boundary follows surface-water divides and surface-water features. Ground-water divides are expected to be coincident with surface-water divides in most areas. The study area/model boundary has been extended from the Higgins and Houghton Lake area to Lake Michigan. This ensures the model encompasses the recharge area for aquifers within the glaciofluvial deposits. It also allows for estimations of direct discharge of ground water to Lake Michigan. Seventeen USGS surface-water gaging stations are located within the study area and will be useful in assuring model accuracy.



Surficial Geology and Thickness



Some of the thickest and most complex glacial drift in Michigan is located in the Northwest Lower Peninsula. In the Cadillac area, up to five glacial aquifers have been identified. The aquifers are composed of sand and gravel and are confined to semiconfined by clay layers of varying thickness. The USGS Regional Aquifer System Analysis described a predominance of glaciofluvial deposits and coarse-textured till in the Northwest Lower Peninsula. These materials are coarser than glacial drift to the south and east of the area. (Westjohn and others, 1994)

Bedrock Geology

The study area is underlain by Late Devonian to Jurassic age bedrock. The Pennsylvanian Saginaw Formation, Mississippian Parma Sandstone and Marshall Sandstone serve as aquifers but are not used as a source of water in the study area. The Saginaw Formation consists of interbedded sandstone, siltstone, shale, coal, and limestone. The sandstone serves as the aquifer and contains both fresh and saline water depending on the location within the Michigan Basin. The Parma Sandstone is a highly permeable medium to coarse-grained sandstone. It contains fresh water within the study area. The Marshall Sandstone in the study area contains fresh-water where it subcrops and is in direct hydraulic connection with permeable glacial deposits. (Westjohn and Weaver, 1996 a,b,c)

